



## DEPARTMENT OF COMMERCE

### National Oceanic and Atmospheric Administration

[RTID 0648-XC454]

#### **Takes of Marine Mammals Incidental to Specified Activities; Taking Marine Mammals Incidental to a Geophysical Survey in the Ross Sea, Antarctica**

**AGENCY:** National Marine Fisheries Service (NMFS), National Oceanic and Atmospheric Administration (NOAA), Commerce.

**ACTION:** Notice; Issuance of an incidental harassment authorization.

**SUMMARY:** In accordance with the regulations implementing the Marine Mammal Protection Act (MMPA) as amended, notification is hereby given that NMFS has issued an Incidental Harassment Authorization (IHA) to the U.S. National Science Foundation (NSF) to incidentally harass marine mammals during geophysical surveys in the Ross Sea, Antarctica.

**DATES:** This authorization is effective from December 15, 2022 through December 14, 2023.

**FOR FURTHER INFORMATION CONTACT:** Jenna Harlacher, Office of Protected Resources, NMFS, (301) 427-8401. Electronic copies of the application and supporting documents, as well as a list of the references cited in this document, may be obtained online at: <https://www.fisheries.noaa.gov/action/incidental-take-authorization-national-science-foundation-office-polar-programs-geophysical>. In case of problems accessing these documents, please call the contact listed above.

#### **SUPPLEMENTARY INFORMATION:**

##### **Background**

The MMPA prohibits the “take” of marine mammals, with certain exceptions. Sections 101(a)(5)(A) and (D) of the MMPA (16 U.S.C. 1361 *et seq.*) direct the Secretary

of Commerce (as delegated to NMFS) to allow, upon request, the incidental, but not intentional, taking of small numbers of marine mammals by U.S. citizens who engage in a specified activity (other than commercial fishing) within a specified geographical region if certain findings are made and either regulations are proposed or, if the taking is limited to harassment, a notice of a proposed IHA is provided to the public for review.

Authorization for incidental takings shall be granted if NMFS finds that the taking will have a negligible impact on the species or stock(s) and will not have an unmitigable adverse impact on the availability of the species or stock(s) for taking for subsistence uses (where relevant). Further, NMFS must prescribe the permissible methods of taking and other “means of effecting the least practicable adverse impact” on the affected species or stocks and their habitat, paying particular attention to rookeries, mating grounds, and areas of similar significance, and on the availability of the species or stocks for taking for certain subsistence uses (referred to in shorthand as “mitigation”); and requirements pertaining to the mitigation, monitoring and reporting of the takings are set forth. The definitions of all applicable MMPA statutory terms cited above are included in the relevant sections below.

### **Summary of Request**

On May 26, 2022, NMFS received a request from NSF for an IHA to take marine mammals incidental to conducting a low energy seismic survey and icebreaking in the Ross Sea. The application was deemed adequate and complete on July 22, 2022. NSF’s request is for take of small numbers of 17 species of marine mammals by Level B harassment only. Neither NSF nor NMFS expects serious injury or mortality to result from this activity and, therefore, an IHA is appropriate. The proposed IHA was published on September 29, 2022 (87 FR 59204). There are no changes from the proposed IHA to the final IHA.

### **Description of Activity**

## Overview

Researchers from Louisiana State University, Texas A&M University, University of Texas at Austin, University of West Florida, and Dauphin Island Sea Lab, with funding from NSF, plan to conduct a two-part low-energy seismic survey from the Research Vessel / Icebreaker (RVIB) Nathaniel B. Palmer (NBP), in the Ross Sea during Austral Summer 2022-2023. The two-part survey would include the Ross Bank and the Drygalski Trough areas. The planned seismic survey would take place in International waters of the Southern Ocean, in water depths ranging from approximately (~) 150 to 1100 meters (m).

The RVIB *Palmer* would deploy up to two 105-cubic inch (in<sup>3</sup>) generator injector (GI) airguns at a depth of 1–4 m with a total maximum discharge volume for the largest, 2-airgun array of 210 in<sup>3</sup> along predetermined track lines. During the Ross Bank survey, ~1920 km of seismic data would be collected and during the Drygalski Trough survey, ~1800 km of seismic acquisition would occur, for a total of 3720 line km.

Although the survey will occur in the Austral summer, some icebreaking activities are expected to be required during the cruise.

The Ross Bank portion of activity is to determine if, how, when, and why the Ross Ice Shelf unpinned from Ross Bank in the recent geologic past, to assess to what degree that event caused a re-organization of ice sheet and ice shelf flow towards its current configuration. The Drygalski Trough activities plan to examine the gas hydrate contribution to the Ross Sea carbon budget. The Drygalski Trough activities would examine the warming and carbon cycling of the ephemeral reservoir of carbon at the extensive bottom ocean layer–sediment interface of the Ross Sea. This large carbon reserve appears to be sealed in the form of gas hydrate and is a thermogenic carbon source and carbon storage in deep sediment hydrates. The warming and ice melting coupled with high thermogenic gas hydrate loadings suggest the Ross Sea is an essential

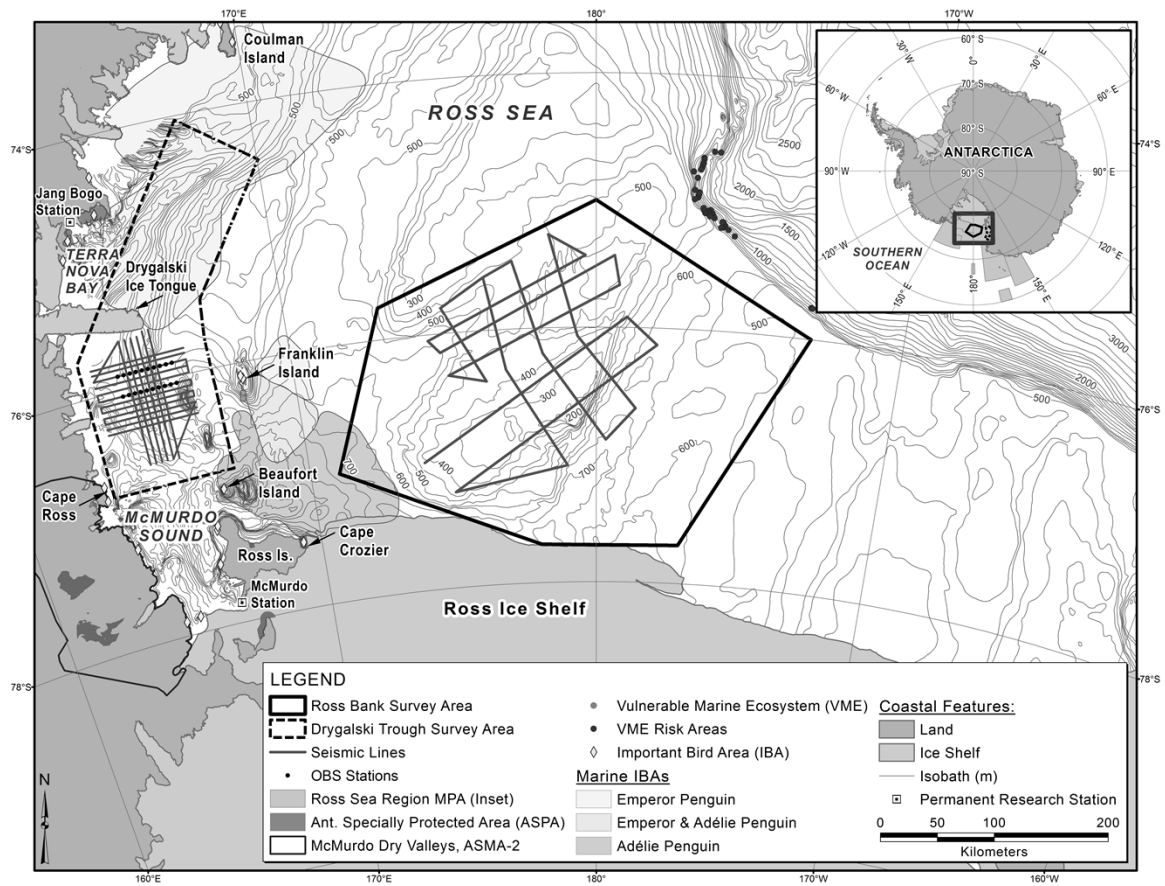
environment to determine contributions of current day and potential future methane, petroleum, and glacial carbon to shallow sediment and water column carbon cycles.

#### *Dates and Duration*

The RVIB *Palmer* would likely depart from Lyttelton, New Zealand, on December 18, 2022, and would return to McMurdo Station, Antarctica, on January 18, 2023, after the program is completed. The cruise is expected to consist of 31 days at sea, including approximately 19 days of seismic operations (including 2 days of sea trials and/or contingency), 1 day of ocean bottom seismometer (OBS) deployment/recovery, and approximately 11 days of transit. Some deviation in timing and ports of call could also result from unforeseen events such as weather or logistical issues.

#### *Specific Geographic Region*

The survey would take place in the Ross Sea, Antarctica (continental shelf between  $\sim 75^{\circ}$ – $77.7^{\circ}$ S and  $171^{\circ}$ E– $173^{\circ}$  E and Drygalski Trough between  $\sim 74^{\circ}$ – $76.7^{\circ}$  S and  $163.6^{\circ}$ E– $170^{\circ}$  E (Figure 1) in international waters of the Southern Ocean in water depths ranging from approximately 150 to 1100 m. Representative survey tracklines are shown in Figure 1; however, the actual survey effort could occur anywhere within the outlined study area as shown. The line locations for the survey area are preliminary and could be refined in light of information from data collected during the study and conditions within the survey area.



**Figure 1 — Ross Sea Survey areas for the low-energy seismic survey in the Ross Sea during austral summer 2022/2023\***

\*Showing representative transect lines and the protected areas. Ant. = Antarctic. ASMA = Antarctic Specially Managed Area. IBA = Important Bird Area. Sources: Davey (2013), CCAMLR (2017), Handley *et al.* (2021), and British Antarctic Survey (2022).

### *Detailed Description of Specific Activity*

The procedures to be used for the survey would entail use of conventional seismic methodology. The survey would involve one source vessel, RVIB *Palmer* and the airgun array would be deployed at a depth of approximately 1-4 m below the surface, spaced approximately 2.4 m apart for the 2-gun array. Seismic acquisition is planned to begin with a standard sea trial to determine which configuration and mode of GI airgun(s) provide the best reflection signals, which depends on sea-state and subsurface conditions. A maximum of two GI airguns would be used. Four GI configurations (each using one or two GI airguns) would be tested during the sea trial (Table 1). The largest volume airgun configuration (configuration 4) was carried forward in our analysis and used for estimating the take numbers for authorization.

The RVIB *Palmer* would deploy two 105 in<sup>3</sup> GI airguns as an energy source with a total volume of ~210 in<sup>3</sup>. Seismic pulses would be emitted at intervals of 5 to 10 seconds from the GI airgun. The receiving system would consist of one hydrophone streamer, 800 m in length, with the vessel traveling at 8.3 km/hr (4.5 knots (kn)) to achieve high-quality seismic reflection data. As the airguns are towed along the survey lines, the hydrophone streamer would receive the returning acoustic signals and transfer the data to the on-board processing system. If sea-ice conditions permit, a multi-channel digital streamer would be used to improve signal-to-noise ratio by digital data processing; if ice is present, a single-channel digital steamer would be employed. When not towing seismic survey gear, the RVIB *Palmer* has a maximum speed of 26.9 km/h (14.5 kn), but cruises at an average speed of 18.7 km/h (10.1 kn). During the Ross Bank survey, ~1920 km of seismic data would be collected and during the Drygalski Trough survey, ~1800 km of seismic acquisition would occur, for a total of 3720 line km.

During the Drygalski Trough survey, 2 deployments of 10 OBSs would occur along 2 different seismic refraction lines (see Fig. 1 for representative lines). Following

refraction shooting of one line, OBSs on that line would be recovered, serviced, and redeployed on a subsequent refraction line. The spacing of OBSs on the initial refraction line would be 5 km apart, but OBSs could be deployed as close together as every 500 m on the subsequent refraction line. All OBSs would be recovered at the end of the survey. To retrieve the OBSs, the instrument is released via an acoustic release system to float to the surface from the wire and/or anchor, which are not retrieved.

**Table 1 -- Four GI configurations (each using one or two GI airguns) would be tested during the sea trial**

<b>Configuration</b>	<b>Airgun Array Total Volume (GI configuration)</b>	<b>Frequency Between Seismic Shots</b>	<b>Streamer Length</b>
1	50 in <sup>3</sup> Harmonic Mode configured as 25 in <sup>3</sup> Generator + 25 Injector in <sup>3</sup>	5-10 seconds	800 m
2	90 in <sup>3</sup> Harmonic Mode configured as 45 in <sup>3</sup> Generator + 45 Injector in <sup>3</sup>	5-10 seconds	
3	50 in <sup>3</sup> True-GI Mode configured as 45 in <sup>3</sup> Generator + 105 Injector in <sup>3</sup>	5-10 seconds	
4	210 in <sup>3</sup> Harmonic Mode configured as 105 in <sup>3</sup> Generator + 105 Injector in <sup>3</sup>	5-10 seconds	

There could be additional seismic operations in the study area associated with equipment testing, re-acquisition due to reasons such as, but not limited to, equipment malfunction, data degradation during poor weather, or interruption due to shut down or track deviation in compliance with IHA requirements. To account for these additional seismic operations, 25 percent has been added in the form of operational days, which is equivalent to adding 25 percent to the line km to be surveyed.

Along with the airgun and OBS operations, additional acoustical data acquisition systems and other equipment may be operated during the seismic survey at any time to meet scientific objectives. The ocean floor would be mapped with a Multibeam Echosounder (MBES), Sub-bottom Profiler (SBP), and/or Acoustic Doppler Current Profiler (ADCP). Data acquisition in the survey area will occur in water depths ranging

from 150 to 700 m. Take of marine mammals is not expected to occur incidental to use of these other sources, whether or not the airguns are operating simultaneously with the other sources. Given their characteristics (e.g., narrow downward-directed beam), marine mammals would experience no more than one or two brief ping exposures, if any exposure were to occur. NMFS does not expect that the use of these sources presents any reasonable potential to cause take of marine mammals.

- 1) *Single Beam Echo Sounder (Knudsen 3260)* – The hull-mounted compressed high-intensity radiated pulse (CHIRP) sonar is operated at 12 kilohertz (kHz) for bottom-tracking purposes or at 3.5 kHz in the sub-bottom profiling mode. The sonar emits energy in a 30° beam from the bottom of the ship and has a sound level of 224 dB re: 1 µPa m (rms).
- 2) *Multibeam Sonar (Kongsberg EM122)* – The hull-mounted, multibeam sonar operates at a frequency of 12 kHz, has an estimated maximum source energy level of 242 dB re 1µPa (rms), and emits a very narrow (< 2°) beam fore to aft and 150° in cross-track. The multibeam system emits a series of nine consecutive 15 millisecond (ms) pulses.
- 3) *Acoustic Doppler Current Profiler (ADCP) (Teledyne RDI VM-150)* – The hull-mounted ADCP operates at a frequency of 150 kHz, with an estimated acoustic output level at the source of 223.6 dB re 1µPa (rms). Sound energy from the ADCP is emitted as a 30°, conically shaped beam.
- 4) *ADCP (Ocean Surveyor OS-38)* – The characteristics of this backup, hull-mounted ADCP unit are similar to the Teledyne VM-150. The ADCP operates at a frequency of 150 kHz with an estimated acoustic output level at the source of 223.6 dB re 1µPa (rms). Sound energy from the ADCP is emitted as a 30° conically-shaped beam.



- 5) *EK biological echo sounder (Simrad ES200-7C, ES38B, ES-120-7C)* – This echo sounder is a split-beam transducer with an estimated acoustic output level at the source of 183-185 dB re 1µPa and emits a 7° beam. It can operate at 38 kHz, 120 kHz and 200 kHz.
- 6) *Acoustic Release* – To retrieve OBSs, an acoustic release transponder (pinger) is used to interrogate the instrument at a frequency of 8-11 kHz, and a response is received at a frequency of 7- 15 kHz. The burn-wire release assembly is then activated, and the instrument is released to float to the surface from the wire and/or anchor which are not retrieved.
- 7) *Oceanographic Sampling* – during the Drygalski Trough study, the researchers would also conduct opportunistic oceanographic sampling as time and scheduling allows, including conductivity, temperature and depth (CTD) measurements, box cores, and/or multi-cores.

## Icebreaking

Icebreaking activities are expected to be limited during the survey. The Ross Sea is generally clear of ice January through February, because of the large Ross Sea Polynya that occurs in front of the Ross Ice Shelf. Heavy ice conditions would hamper the planned activities, as noise from icebreaking degrades the quality of the geophysical data to be acquired. If the RVIB *Palmer* would find itself in heavy ice conditions, it is unlikely that the airgun(s) and streamer could be towed, as this could damage the equipment and generate noise interference. The seismic survey could take place in low ice conditions if the RVIB *Palmer* were able to generate an open path behind the vessel. The RVIB *Palmer* is not rated for breaking multi-year ice and generally avoids transiting through ice two years or older and more than one m thick. If sea ice were to be encountered during the survey, the RVIB *Palmer* would likely proceed through one-year sea ice, and new, thin ice, but would follow leads wherever possible. Any time spent icebreaking would

take away time from the planned research activities, as the vessel would travel slower in ice-covered seas. Based on estimated transit to the survey area, it is estimated that the RVIB *Palmer* would break ice up to a distance of 500 km. Based on a ship speed of 5 kn under moderate ice conditions, this distance represents approximately 54 hours of icebreaking (or 2.2 days). Transit through areas of primarily open water containing brash ice or pancake ice is not considered icebreaking for the purposes of this assessment.

Mitigation, monitoring, and reporting measures are described in detail later in this document (please see **Mitigation** and **Monitoring and Reporting**).

### **Comments and Responses**

A notice of NMFS' proposal to issue an IHA to NSF was published in the **Federal Register** on September 29, 2022 (87 FR 59204). That notice described, in detail, NSF's activities, the marine mammal species that may be affected by the activities, and the anticipated effects on marine mammals. In that notice, we requested public input on the request for authorization described therein, our analyses, the proposed authorization, and any other aspect of the notice of proposed IHA, and requested that interested persons submit relevant information, suggestions, and comments. This proposed notice was available for a 30-day public comment period.

NMFS received no public comments.

### **Description of Marine Mammals in the Area of Specified Activities**

Sections 3 and 4 of the application summarize available information regarding status and trends, distribution and habitat preferences, and behavior and life history of the potentially affected species. NMFS fully considered all of this information, and we refer the reader to these descriptions instead of reprinting the information. Additional information regarding population trends and threats may be found in NMFS' Stock Assessment Reports (SARs; [www.fisheries.noaa.gov/national/marine-mammal-protection/marine-mammal-stock-assessments](http://www.fisheries.noaa.gov/national/marine-mammal-protection/marine-mammal-stock-assessments)) and more general information about these

species (e.g., physical and behavioral descriptions) may be found on NMFS' website (<https://www.fisheries.noaa.gov/find-species>).

The populations of marine mammals considered in this document do not occur within the U.S. Exclusive Economic Zone (EEZ) and are therefore not assigned to stocks and are not assessed in NMFS' Stock Assessment Reports (SAR). As such, information on potential biological removal (PBR; defined by the MMPA as the maximum number of animals, not including natural mortalities, that may be removed from a marine mammal stock while allowing that stock to reach or maintain its optimum sustainable population) and on annual levels of serious injury and mortality from anthropogenic sources are not available for these marine mammal populations. Abundance estimates for marine mammals in the survey location are lacking; therefore estimates of abundance presented here are based on a variety of other sources including International Whaling Commission (IWC) population estimates, the International Union for Conservation of Nature's (IUCN) Red List of Threatened Species, and various literature estimates (see IHA application for further detail), as this is considered the best available information on potential abundance of marine mammals in the area.

Seventeen species of marine mammals could occur in the Ross Sea, including 5 mysticetes (baleen whales), 7 odontocetes (toothed whales) and 5 pinniped species (Table 2). Another seven species occur in the Sub-Antarctic but are unlikely to be encountered in the survey areas, as they generally occur farther to the north than the project area. These species are not discussed further here but include: the southern right whale (*Eubalaena australis*), common (dwarf) minke whale (*Balaenoptera acutorostrata*), Cuvier's beaked (*Ziphius cavirostris*), Gray's beaked (*Mesoplodon grayi*), Hector's beaked (*Mesoplodon hectori*), and spade-toothed beaked (*Mesoplodon traversii*) whales, southern right whale dolphin (*Lissodelphis peronii*), and spectacled porpoise (*Phocoena dioptrica*). Table 2 lists all species with expected potential for occurrence in the Ross

Sea, Antarctica, and summarizes information related to the population, including regulatory status under the MMPA and ESA.

**Table 2 -- Marine Mammal Species Potentially Present in the Project Area Expected To Be Affected by the Specified Activities**

Common name	Scientific name	Stock <sup>1</sup>	ESA/MMPA status; Strategic (Y/N) <sup>2</sup>	Stock abundance
Order Cetartiodactyla – Cetacea – Superfamily Mysticeti (baleen whales)				
Family Balaenopteridae (rorquals)				
Blue whale	<i>Balaenoptera musculus</i>	N/A	E/D;Y	10,000-25,000 <sup>5</sup> 1,700 <sup>7</sup>
Fin whale	<i>Balaenoptera physalus</i>	N/A	E/D;Y	140,000 <sup>5</sup> 38,200 <sup>6</sup>
Humpback whale	<i>Megaptera novaeangliae</i>	N/A	-	90,000-100,000 <sup>5</sup> 80,000 <sup>10</sup> 42,000 <sup>11</sup>
Antarctic minke whale <sup>6</sup>	<i>Balaenoptera bonaerensis</i>	N/A	-	Several 100,000 <sup>5</sup> 515,000 <sup>9</sup>
Sei whale	<i>Balaenoptera borealis</i>	N/A	E	70,000 <sup>8</sup>
Superfamily Odontoceti (toothed whales, dolphins, and porpoises)				
Family Physeteridae				
Sperm whale	<i>Physeter macrocephalus</i>	N/A	E	360,000 <sup>12</sup> 12,069 <sup>13</sup>
Family Ziphiidae (beaked whales)				
Arnoux's beaked whale	<i>Berardius arnuxii</i>	N/A	-	599,300 <sup>14</sup>
Strap-toothed beaked whale	<i>Mesoplodon grayi</i>	N/A	-	599,300 <sup>14</sup>
Southern bottlenose whale	<i>Hyperoodon planifrons</i>	N/A	-	599,300 <sup>14</sup>
Family Delphinidae				
Killer whale	<i>Orcinus orca</i>	N/A	-	50,000 <sup>16</sup> 25,000 <sup>17</sup>
Long-finned pilot whale	<i>Globicephala macrorhynchus</i>	N/A	-	200,000 <sup>15</sup>
Hourglass dolphin	<i>Lagenorhynchus cruciger</i>	NA	-	144,300 <sup>15</sup>
Family Phocidae (earless seals)				
Crabeater seal	<i>Lobodon carcinophaga</i>	N/A	-	5-10 million <sup>18</sup> 1.7 million <sup>19</sup>
Leopard seal	<i>Hydrurga leptonyx</i>	N/A	-	222,000-440,000 <sup>5,20</sup>
Southern elephant seal	<i>Mirounga lionina</i>	N/A	-	750,000 <sup>23</sup>

Ross seal	<i>Ommatophoca rossii</i>	N/A	-	250,000 <sup>22</sup>
Weddell seal	<i>Leptonychotes weddellii</i>	N/A	-	1 million <sup>5, 21</sup>

N.A. = data not available  
<sup>1</sup> Occurrence in area at the time of the planned activities; based on professional opinion and available data.  
<sup>2</sup> U.S. Endangered Species Act: EN = endangered, NL = not listed.  
<sup>5</sup> Worldwide (Jefferson *et al.*, 2015).  
<sup>6</sup> Antarctic (Aguilar and García-Vernet 2018).  
<sup>7</sup> Antarctic (Branch *et al.*, 2007).  
<sup>8</sup> Southern Hemisphere (Horwood 2018).  
<sup>9</sup> Southern Hemisphere (IWC 2020).  
<sup>10</sup> Southern Hemisphere (Clapham 2018).  
<sup>11</sup> Antarctic feeding area (IWC 2020).  
<sup>12</sup> Worldwide (Whitehead 2002).  
<sup>13</sup> Antarctic south of 60°S (Whitehead 2002).  
<sup>14</sup> All beaked whales south of the Antarctic Convergence; mostly southern bottlenose whales (Kasamatsu and Joyce 1995)  
<sup>15</sup> Kasamatsu and Joyce (1995).  
<sup>16</sup> Worldwide (Forney and Wade 2006).  
<sup>17</sup> Minimum estimate for Southern Ocean (Branch and Butterworth 2001)  
<sup>18</sup> Worldwide (Bengtson and Stewart 2018).  
<sup>19</sup> Ross and Amundsen seas (Bengtson *et al.*, 2011).  
<sup>20</sup> Rogers *et al.*, 2018.  
<sup>21</sup> Hückstädt 2018a.  
<sup>22</sup> Worldwide (Curtis *et al.*, 2011 in Hückstädt 2018b).  
<sup>23</sup> Total world population (Hindell *et al.*, 2016).

All species that could potentially occur in the survey areas are included in Table 2. As described below, all 17 species temporally and spatially co-occur with the activity to the degree that take is reasonably likely to occur, and we have authorized it.

A detailed description of the species likely to be affected by the geophysical surveys, including brief introductions to the species and relevant stocks as well as available information regarding population trends and threats, and information regarding local occurrence, were provided in NSF's IHA application and summarized in the **Federal Register** notice for the proposed IHA (87 FR 59204; September 29, 2022); since that time, we are not aware of any changes in the status of these species and stocks; therefore detailed descriptions are not provided here. Please refer to that **Federal Register** notice for these descriptions. Please also refer to the NMFS' website (<https://www.fisheries.noaa.gov/find-species>) for generalized species accounts.

### *Marine Mammal Hearing*

Hearing is the most important sensory modality for marine mammals underwater, and exposure to anthropogenic sound can have deleterious effects. To appropriately

assess the potential effects of exposure to sound, it is necessary to understand the frequency ranges marine mammals are able to hear. Not all marine mammal species have equal hearing capabilities (*e.g.*, Richardson *et al.*, 1995; Wartzok and Ketten, 1999; Au and Hastings, 2008). To reflect this, Southall *et al.* (2007, 2019) recommended that marine mammals be divided into hearing groups based on directly measured (behavioral or auditory evoked potential techniques) or estimated hearing ranges (behavioral response data, anatomical modeling, etc.). Note that no direct measurements of hearing ability have been successfully completed for mysticetes (*i.e.*, low-frequency cetaceans). Subsequently, NMFS (2018) described generalized hearing ranges for these marine mammal hearing groups. Generalized hearing ranges were chosen based on the approximately 65 decibel (dB) threshold from the normalized composite audiograms, with the exception for lower limits for low-frequency cetaceans where the lower bound was deemed to be biologically implausible and the lower bound from Southall *et al.* (2007) retained. Marine mammal hearing groups and their associated hearing ranges are provided in Table 3.

**Table 3 -- Marine Mammal Hearing Groups (NMFS, 2018)**

Hearing Group	Generalized Hearing Range*
Low-frequency (LF) cetaceans (baleen whales)	7 Hz to 35 kHz
Mid-frequency (MF) cetaceans (dolphins, toothed whales, beaked whales, bottlenose whales)	150 Hz to 160 kHz
High-frequency (HF) cetaceans (true porpoises, <i>Kogia</i> , river dolphins, Cephalorhynchid, <i>Lagenorhynchus cruciger</i> & <i>L. australis</i> )	275 Hz to 160 kHz
Phocid pinnipeds (PW) (underwater) (true seals)	50 Hz to 86 kHz
Otariid pinnipeds (OW) (underwater) (sea lions and fur seals)	60 Hz to 39 kHz
* Represents the generalized hearing range for the entire group as a composite ( <i>i.e.</i> , all species within the group), where individual species' hearing ranges are typically not as broad. Generalized hearing range chosen based on ~65 dB threshold from normalized composite audiogram, with the exception for lower limits for LF cetaceans (Southall <i>et al.</i> 2007) and PW pinniped (approximation).	

The pinniped functional hearing group was modified from Southall *et al.* (2007) on the basis of data indicating that phocid species have consistently demonstrated an extended frequency range of hearing compared to otariids, especially in the higher frequency range (Hemilä *et al.*, 2006; Kastelein *et al.*, 2009; Reichmuth and Holt, 2013).

For more detail concerning these groups and associated frequency ranges, please see NMFS (2018) for a review of available information.

### **Potential Effects of Specified Activities on Marine Mammals and their Habitat**

The effects of underwater noise from NSF's survey activities have the potential to result in behavioral harassment of marine mammals in the vicinity of the survey area. The notice of proposed IHA (87 FR 59204; September 29, 2022) included a discussion of the effects of anthropogenic noise on marine mammals and the potential effects of underwater noise from NSF on marine mammals and their habitat. That information and analysis is incorporated by reference into this final IHA determination and is not repeated here; please refer to the notice of proposed IHA (87 FR 59204; September 29, 2022).

### **Estimated Take**

This section provides an estimate of the number of incidental takes authorized through the IHA, which will inform both NMFS' consideration of "small numbers," and the negligible impact determinations.

Harassment is the only type of take expected to result from these activities. Except with respect to certain activities not pertinent here, section 3(18) of the MMPA defines "harassment" as any act of pursuit, torment, or annoyance, which (i) has the potential to injure a marine mammal or marine mammal stock in the wild (Level A harassment); or (ii) has the potential to disturb a marine mammal or marine mammal stock in the wild by causing disruption of behavioral patterns, including, but not limited to, migration, breathing, nursing, breeding, feeding, or sheltering (Level B harassment).

All authorized takes are by Level B harassment, involving temporary changes in behavior. No Level A harassment is expected or authorized. In the sections below, we describe methods to estimate the number of Level B harassment events. The main sources of distributional and numerical data used in deriving the estimates are summarized below.

Generally speaking, we estimate take by considering: (1) acoustic thresholds above which NMFS believes the best available science indicates marine mammals will be behaviorally harassed or incur some degree of hearing impairment; (2) the area or volume of water that will be ensonified above these levels in a day; (3) the density or occurrence of marine mammals within these ensonified areas; and (4) the number of days of activities. We note that while these basic factors can contribute to a basic calculation to provide an initial prediction of takes, additional information that can qualitatively inform take estimates is also sometimes available (*e.g.*, previous monitoring results or average group size). Below, we describe the factors considered here in more detail and present the authorized take estimate.

#### *Acoustic Thresholds*

NMFS recommends the use of acoustic thresholds that identify the received level of underwater sound above which exposed marine mammals would be reasonably expected to be behaviorally harassed (equated to Level B harassment) or to incur PTS of some degree (equated to Level A harassment).

*Level B Harassment* —Though significantly driven by received level, the onset of behavioral disturbance from anthropogenic noise exposure is also informed by varying degrees by other factors related to the source or exposure context (*e.g.*, frequency, predictability, duty cycle, duration of the exposure, signal-to-noise ratio, distance to the source), the environment (*e.g.*, bathymetry, other noises in the area, predators in the area), and the receiving animals (hearing, motivation, experience, demography, life stage, depth) and can be difficult to predict (*e.g.*, Southall *et al.*, 2007, 2021, Ellison *et al.*,



2012). Based on what the available science indicates and the practical need to use a threshold based on a metric that is both predictable and measurable for most activities, NMFS typically uses a generalized acoustic threshold based on received level to estimate the onset of behavioral harassment. NMFS generally predicts that marine mammals are likely to be behaviorally harassed in a manner considered to be Level B harassment when exposed to underwater anthropogenic noise above root-mean-squared pressure received levels (RMS SPL) of 120 dB (referenced to 1 micropascal (re 1  $\mu$ Pa)) for continuous (e.g., vibratory pile-driving, drilling) and above RMS SPL 160 dB re 1  $\mu$ Pa (rms) for non-explosive impulsive (e.g., seismic airguns) or intermittent (e.g., scientific sonar) sources.

NSF's survey includes the use of impulsive seismic sources (e.g., GI-airgun) and continuous icebreaking, therefore the 160 and 120 dB re 1  $\mu$ Pa (rms) criteria are applicable for analysis of Level B harassment.

*Level A harassment*—NMFS' Technical Guidance for Assessing the Effects of Anthropogenic Sound on Marine Mammal Hearing (Version 2.0) (Technical Guidance, 2018) identifies dual criteria to assess auditory injury (Level A harassment) to five different marine mammal groups (based on hearing sensitivity) as a result of exposure to noise from two different types of sources (impulsive or non-impulsive). L-DEO's survey includes the use of impulsive and intermittent sources.

For more information, see NMFS' 2018 Technical Guidance, which may be accessed at: [www.fisheries.noaa.gov/national/marine-mammal-protection/marine-mammal-acoustic-technical-guidance](http://www.fisheries.noaa.gov/national/marine-mammal-protection/marine-mammal-acoustic-technical-guidance).

### *Ensonified Area*

Here, we describe operational and environmental parameters of the activity that are used in estimating the area ensonified above the acoustic thresholds, including source levels and transmission loss coefficient.

The survey would entail the use of a 2-airgun array with a total discharge of 210 in<sup>3</sup> at a tow depth of 1-4 m (with the worst-case scenario of 4 m assumed for purposes of modeling). L-DEO model results are used to determine the 160 dB<sub>rms</sub> radius for the 2-airgun array water depth ranging from 150-700 m. Received sound levels were predicted by L-DEO's model (Diebold *et al.*, 2010) as a function of distance from the airguns, for the two 105 in<sup>3</sup> airguns. This modeling approach uses ray tracing for the direct wave traveling from the array to the receiver and its associated source ghost (reflection at the air-water interface in the vicinity of the array), in a constant-velocity half-space (infinite homogenous ocean layer, unbounded by a seafloor). In addition, propagation measurements of pulses from a 36-airgun array at a tow depth of 6 m have been reported in deep water (~1,600 m), intermediate water depth on the slope (~600-1,100 m), and shallow water (~50 m) in the Gulf of Mexico in 2007-2008 (Tolstoy *et al.*, 2009; Diebold *et al.*, 2010).

For deep and intermediate water cases, the field measurements cannot be used readily to derive the Level A and Level B harassment isopleths, as at those sites the calibration hydrophone was located at a roughly constant depth of 350-550 m, which may not intersect all the SPL isopleths at their widest point from the sea surface down to the maximum relevant water depth (~2,000 m) for marine mammals. At short ranges, where the direct arrivals dominate and the effects of seafloor interactions are minimal, the data at the deep sites are suitable for comparison with modeled levels at the depth of the calibration hydrophone. At longer ranges, the comparison with the model – constructed from the maximum SPL through the entire water column at varying distances from the airgun array – is the most relevant.

In deep and intermediate water depths at short ranges, sound levels for direct arrivals recorded by the calibration hydrophone and L-DEO model results for the same array tow depth are in good alignment (see Figures 12 and 14 in Appendix H of NSF-

USGS 2011). Consequently, isopleths falling within this domain can be predicted reliably by the L-DEO model, although they may be imperfectly sampled by measurements recorded at a single depth. At greater distances, the calibration data show that seafloor-reflected and sub-seafloor-refracted arrivals dominate, whereas the direct arrivals become weak and/or incoherent (see Figures 11, 12, and 16 in Appendix H of NSF-USGS 2011). Aside from local topography effects, the region around the critical distance is where the observed levels rise closest to the model curve. However, the observed sound levels are found to fall almost entirely below the model curve. Thus, analysis of the Gulf of Mexico calibration measurements demonstrates that although simple, the L-DEO model is a robust tool for conservatively estimating isopleths.

The survey would acquire data with two 105-in<sup>3</sup> guns at a tow depth of 1–4 m. For deep water (>1000 m), we use the deep-water radii obtained from L-DEO model results down to a maximum water depth of 2,000 m for the airgun array. The radii for intermediate water depths (100–1,000 m) are derived from the deep-water ones by applying a correction factor (multiplication) of 1.5, such that observed levels at very near offsets fall below the corrected mitigation curve (see Figure 16 in Appendix H of NSF-USGS 2011).

L-DEO’s modeling methodology is described in greater detail in NSF’s IHA application. The estimated distances to the Level B harassment isopleth for the airgun configuration are shown in Table 4.

**Table 4 -- Predicted Radial Distances from the RVIB *Palmer* Seismic Source to Isopleths Corresponding to Level B Harassment Threshold**

Airgun Configuration	Water Depth (m) <sup>a</sup>	Predicted Distances (m) to 160 dB received sound level
Two 105-in3 GI guns	>1,000	726 <sup>b</sup>
	100-1,000	1,089 <sup>c</sup>

<sup>a</sup> No survey effort would occur in water >1000 m; the distance for this water depth is included for informational purposes only.

<sup>b</sup> Distance is based on L-DEO model results.

<sup>c</sup> Distance is based on L-DEO model results with a 1.5 × correction factor between deep and intermediate water depths.

Table 5 presents the modeled PTS isopleths for each marine mammal hearing group based on the L-DEO modeling incorporated in the companion User Spreadsheet (NMFS 2018).

**Table 5 -- Modeled Radial Distances to Isopleths Corresponding to Level A Harassment Thresholds**

Hearing Group	SEL Cumulative PTS Threshold (dB) <sup>1</sup>	SEL Cumulative PTS Distance (m) <sup>1</sup>	Pk PTS Threshold (dB) <sup>1</sup>	Pk PTS Distance (m) <sup>1</sup>
Low-frequency cetaceans	183	25.4	219	6.69
Mid-frequency cetaceans	185	0.0	230	1.50
High-frequency cetaceans	155	0.0	202	47.02
Phocid pinnipeds	185	0.3	218	7.53
Otariid pinnipeds	203	0.0	232	0.92

<sup>1</sup> Cumulative sound exposure level for PTS (SEL<sub>cum</sub>PTS) or Peak (SPL<sub>flat</sub>) resulting in Level A harassment (*i.e.*, injury). Based on 2018 NMFS Acoustic Technical Guidance (NMFS 2018).

Predicted distances to Level A harassment isopleths, which vary based on marine mammal hearing groups, were calculated based on modeling performed by L-DEO using the Nucleus software program and the NMFS User Spreadsheet, described below. The acoustic thresholds for impulsive sounds (*e.g.*, airguns) contained in the Technical Guidance were presented as dual metric acoustic thresholds using both SEL<sub>cum</sub> and peak sound pressure metrics (NMFS 2016a). As dual metrics, NMFS considers onset of PTS (Level A harassment) to have occurred when either one of the two metrics is exceeded (*i.e.*, metric resulting in the largest isopleth). The SEL<sub>cum</sub> metric considers both level and duration of exposure, as well as auditory weighting functions by marine mammal hearing group. In recognition of the fact that the requirement to calculate Level A harassment ensonified areas could be more technically challenging to predict due to the duration component and the use of weighting functions in the new SEL<sub>cum</sub> thresholds, NMFS developed an optional User Spreadsheet that includes tools to help predict a simple

isopleth that can be used in conjunction with marine mammal density or occurrence to facilitate the estimation of take numbers.

The  $SEL_{cum}$  for the two-GI airgun array is derived from calculating the modified farfield signature. The farfield signature is often used as a theoretical representation of the source level. To compute the farfield signature, the source level is estimated at a large distance (right) below the array (*e.g.*, 9 km), and this level is back projected mathematically to a notional distance of 1 m from the array's geometrical center. However, it has been recognized that the source level from the theoretical farfield signature is never physically achieved at the source when the source is an array of multiple airguns separated in space (Tolstoy *et al.*, 2009). Near the source (at short ranges, distances <1 km), the pulses of sound pressure from each individual airgun in the source array do not stack constructively as they do for the theoretical farfield signature. The pulses from the different airguns spread out in time such that the source levels observed or modeled are the result of the summation of pulses from a few airguns, not the full array (Tolstoy *et al.*, 2009). At larger distances, away from the source array center, sound pressure of all the airguns in the array stack coherently, but not within one time sample, resulting in smaller source levels (a few dB) than the source level derived from the farfield signature. Because the farfield signature does not take into account the interactions of the two airguns that occur near the source center and is calculated as a point source (single airgun), the modified farfield signature is a more appropriate measure of the sound source level for large arrays. For this smaller array, the modified farfield changes will be correspondingly smaller as well, but this method is used for consistency across all array sizes.

The Level B harassment estimates are based on a consideration of the number of marine mammals that could be within the area around the operating airgun array where received levels of sound  $\geq 160$  dB re 1  $\mu$ Parms are predicted to occur (see Table 1). The

estimated numbers are based on the densities (numbers per unit area) of marine mammals expected to occur in the area in the absence of seismic surveys. To the extent that marine mammals tend to move away from seismic sources before the sound level reaches the criterion level and tend not to approach an operating airgun array, these estimates likely overestimate the numbers actually exposed to the specified level of sound.

### *Marine Mammal Occurrence*

In this section we provide information about the occurrence of marine mammals, including density or other relevant information, that will inform the take calculations.

For the planned survey area, NSF provided density data for marine mammal species that might be encountered in the project area. NMFS concurred that these data are the best available. Sightings data from the 2002–2003 (IWC-SOWER) Circumpolar Cruise, Area V (Ensor *et al.* 2003) were used to estimate densities for four mysticete (*i.e.*, humpback whale, Antarctic minke whale, fin whale, and blue whale) and six odontocete species (*i.e.*, sperm whale, southern bottlenose whale, strap-toothed beaked whale, killer whale, long-finned pilot whale and hourglass dolphin). Densities for sei and Arnoux's beaked whales were based on those reported in the Naval Marine Species Density Database (NMSDD) (Department of Navy 2012). NMFS finds NMSDD a reasonable representation of the lower likelihood of encountering these species, as evidenced by previous monitoring reports from projects in the same or similar area (85 FR 5619; January 31, 2020 & 80 FR 4886; January 29, 2015) and primary literature on whale species density distribution in the Antarctic (Cetacean Population Studies Vol.2, 2020). Densities of pinnipeds were estimated using best available data (Waterhouse 2001; Pinkerton and Bradford-Grieve 2010) and dividing the estimated population of pinnipeds (number of animals) by the area of the Ross Sea (300,000 km<sup>2</sup>). Estimated densities used and Level B harassment ensonified areas to inform take estimates are presented in Table 6.

**Table 6 -- Marine Mammal Densities and total Ensonified Area of activities in the Survey Area**

Species	Estimated Density (#/ km <sup>2</sup> )	Ross Bank Level B Ensonified Area (km <sup>2</sup> )	Drygalski Tough Level B Ensonified Area (km <sup>2</sup> )	Icebreaking Level B Ensonified Area (km <sup>2</sup> )
Fin whale	0.0306570	5,272	4,942	8,278
Blue whale	0.0065132			
Sei whale	0.0046340			
Antarctic minke whale	0.0845595			
Humpback whale	0.0321169			
Sperm whale	0.0098821			
Southern bottlenose whale	0.0117912			
Arnoux's beaked whale	0.0134420			
Strap-toothed beaked whale	0.0044919			
Killer whale	0.0208872			
Long-finned pilot whale	0.0399777			
Hourglass dolphin	0.0189782			
Crabeater seal	0.6800000			
Leopard seal	0.0266700			
Ross seal	0.0166700			
Weddell seal	0.1066700			
Southern elephant seal	0.0001300			

### *Take Estimation*

Here we describe how the information provided above is synthesized to produce a quantitative estimate of the take that is reasonably likely to occur and authorized.

### *Seismic Surveys*

In order to estimate the number of marine mammals predicted to be exposed to sound levels that would result in Level B harassment, the radial distance from the airgun

array to the predicted isopleth corresponding to the Level B harassment threshold is calculated, as described above. The radial distance is then used to calculate the area around the airgun array predicted to be ensonified to the sound level that exceed the Level B harassment threshold. The area estimated to be ensonified in a single day of the survey is then calculated (Table 10), based on the area predicted to be ensonified around the array and the estimated trackline distance traveled per day. The daily ensonified area was then multiplied by the number of estimated seismic acquisition days –9.6 days for the Ross Bay survey and 9 days for the Drygalski Trough survey. The product is then multiplied by 1.25 to account for the additional 25 percent contingency, as described above. This results in an estimate of the total area (km<sup>2</sup>) expected to be ensonified to the Level B harassment threshold.

**Table 7 -- Area (km<sup>2</sup>) to be Ensonified to the Level B Harassment Threshold**

Survey Area	Distance/Day (km)	Threshold Distance (km)	Daily Ensonified Area With Endcap (km <sup>2</sup> )	Number of Survey Days	Plus 25% (Contingency)	Total Ensonified Area (km <sup>2</sup> )
Ross Bank	200	1.089	439	9.6	12	5272
Drygalski Trough	200	1.089	439	9	11.25	4942

Based on the small Level A harassment isopleths (as shown in Table 5) and in consideration of the mitigation measures (see **Mitigation** section below), take by Level A harassment is not expected to occur and is not authorized.

The marine mammals predicted to occur within the respective areas, based on estimated densities (Table 6), are assumed to be incidentally taken. Estimated take, and percentages of the stocks estimated to be taken, for the survey are shown in Table 12.

#### Icebreaking

Applying the maximum estimated amount of icebreaking expected by NSF, *i.e.* 500 km, we calculate the total ensonified area of icebreaking (Table 8). Estimates of exposures assume that there would be approximately 2 days of icebreaking activities; the calculated takes have been increased by 25 percent (2.75 days).

**Table 8 --Ensonified area for icebreaking activities**



Criteria	Distance/Day (km)	Threshold Distance (km)	Daily Ensonified Area With Endcap (km <sup>2</sup> )	Number of Survey Days	Plus 25% (Contingency)	Total Ensonified Area (km <sup>2</sup> )
120 dB	223	6.456	3010	2.2	2.75	8278

Estimated take from icebreaking for the survey are shown in Table 12. As most cetaceans do not occur in pack ice, the estimates of the numbers of marine mammals potentially exposed to sounds greater than the Level B harassment threshold (120 dB re 1  $\mu$ Pa rms) are precautionary and probably overestimate the actual numbers of marine mammals that could be involved. No takes by Level A harassment are expected or authorized. The estimated number of takes for pinnipeds accounts for both seals that may be in the water and those hauled out on ice surfaces. Few cetaceans are expected to be seen during icebreaking activities, although some could occur along the ice margin.

**Table 9 -- Total marine mammal take estimated for the survey in the Ross Sea**

Species	Level B Take		Total Take Authorized	Population Abundance	Percent of Population
	All Seismic	Icebreaking			
Fin whale	313	254	567	38,200	1.48
Blue whale	67	54	121	1,700	7.12
Sei whale	47	38	85	10,000	0.85
Antarctic minke whale	864	700	1,564	515,000	0.3
Humpback whale	328	266	594	42,000	1.41
Sperm whale	101	82	183	12,069	1.51
Southern bottlenose whale	120	98	218	599,300	0.04
Arnoux's beaked whale	137	111	249	599,300	0.04
Strap-toothed beaked whale	46	37	83	599,300	0.01
Killer whale	213	173	386	25,000	1.55
Long-finned pilot whale	408	331	739	200,000	0.37
Hourglass dolphin	194	157	351	144,300	0.24
Crabeater seal	6,946	5,629	12,575	1,700,000	1
Leopard seal	272	221	493	220,000	0.22
Ross seal	170	138	308	250,000	0.12
Weddell seal	1,090	883	1,973	1,000,000	0.2
Southern elephant seal	2	1	3	750,000	<0.01

## Mitigation

In order to issue an IHA under section 101(a)(5)(D) of the MMPA, NMFS must set forth the permissible methods of taking pursuant to the activity, and other means of effecting the least practicable impact on the species or stock and its habitat, paying particular attention to rookeries, mating grounds, and areas of similar significance, and on the availability of the species or stock for taking for certain subsistence uses (latter not applicable for this action). NMFS regulations require applicants for incidental take authorizations to include information about the availability and feasibility (economic and technological) of equipment, methods, and manner of conducting the activity or other means of effecting the least practicable adverse impact upon the affected species or stocks, and their habitat (50 CFR 216.104(a)(11)).

In evaluating how mitigation may or may not be appropriate to ensure the least practicable adverse impact on species or stocks and their habitat, as well as subsistence uses where applicable, NMFS considers two primary factors:

(1) The manner in which, and the degree to which, the successful implementation of the measure(s) is expected to reduce impacts to marine mammals, marine mammal species or stocks, and their habitat. This considers the nature of the potential adverse impact being mitigated (likelihood, scope, range). It further considers the likelihood that the measure will be effective if implemented (probability of accomplishing the mitigating result if implemented as planned), the likelihood of effective implementation (probability implemented as planned), and;

(2) The practicability of the measures for applicant implementation, which may consider such things as cost, and impact on operations.

Mitigation measures that would be adopted during the planned survey include, but are not limited to: (1) Vessel speed or course alteration, provided that doing so would not compromise operation safety requirements. (2) GI-airgun shut down within exclusion zones (EZ)s, and (3) ramp-up procedures.

### *Vessel-Visual Based Mitigation Monitoring*

Visual monitoring requires the use of trained observers (herein referred to as visual protected species observers (PSOs)) to scan the ocean surface visually for the presence of marine mammals. The area to be scanned visually includes primarily the exclusion zone, within which observation of certain marine mammals requires shutdown of the acoustic source, but also the buffer zone. The buffer zone means an area beyond the exclusion zone to be monitored for the presence of marine mammals that may enter the exclusion zone. During pre-start clearance (*i.e.*, before ramp-up begins), the buffer zone also acts as an extension of the exclusion zone in that observations of marine mammals within the buffer zone would also prevent airgun operations from beginning (*i.e.*, ramp-up). The buffer zone encompasses the area at and below the sea surface from the edge of the 100 m exclusion zone measured from the edges of the airgun array. Visual monitoring of the exclusion zone and adjacent waters is intended to establish and, when visual conditions allow, maintain zones around the sound source that are clear of marine mammals, thereby reducing or eliminating the potential for injury and minimizing the potential for more severe behavioral reactions for animals occurring closer to the vessel. Visual monitoring of the buffer zone is intended to (1) provide additional protection to naïve marine mammals that may be in the area during pre-clearance, and (2) during airgun use, aid in establishing and maintaining the exclusion zone by altering the visual observer and crew of marine mammals that are outside of, but may approach and enter, the exclusion zone.

NSF must use independent, dedicated, trained visual PSOs, meaning that the PSOs must be employed by a third-party observer provider, must not have tasks other than to conduct observational effort, collect data, and communicate with and instruct relevant vessel crew with regard to the presence of protected species and mitigation

requirements, and must have successfully completed an approved PSO training course.

PSO resumes shall be provided to NMFS for approval.

At least one visual PSO must have a minimum of 90 days at-sea experience working in that role during a shallow penetration or low-energy survey, with no more than 18 months elapsed since the conclusion of the at-sea experience. One PSO with such experience shall be designated as the lead for the entire protected species observation team. The lead PSO shall serve as primary point of contact for the vessel operator and ensure all PSO requirements per the IHA are met. To the maximum extent practicable, the experienced PSOs should be scheduled to be on duty with those PSOs with the appropriate training but who have not yet gained relevant experience.

During survey operations (*e.g.*, any day on which use of the acoustic source is planned to occur, and whenever the acoustic source is in the water, whether activated or not), a minimum of one PSO must be on duty and conducting visual observations at all times during daylight hours (*i.e.*, from 30 minutes prior to sunrise through 30 minutes following sunset) and 30 minutes prior to and during ramp-up of the airgun array. Visual monitoring of the exclusion and buffer zones must begin no less than 30 minutes prior to ramp-up and must continue until one hour after use of the acoustic source ceases or until 30 minutes past sunset. Visual PSOs must coordinate to ensure 360 degree visual coverage around the vessel from the most appropriate observation posts, and must conduct visual observations using binoculars and the naked eye while free from distractions and in a consistent, systematic, and diligent manner.

PSOs shall establish and monitor the exclusion and buffer zones. These zones shall be based upon the radial distance from the edges of the acoustic source (rather than being based on the center of the array or around the vessel itself). During use of the acoustic source (*i.e.*, anytime airguns are active, including ramp-up) shall be

communicated to the operator to prepare for the potential shutdown of the acoustic source.

During use of the airgun, detections of marine mammals within the buffer zone (but outside the exclusion zone) should be communicated to the operator to prepare for the potential shutdown of the acoustic source. Visual PSOs will immediately communicate all observations to the on duty acoustic PSO(s), including any determination by the PSO regarding species identification, distance, and bearing and the degree of confidence in the determination. Any observations of marine mammals by crew members shall be relayed to the PSO team. During good conditions (*e.g.*, daylight hours; Beaufort sea state (BSS) 3 or less), visual PSOs shall conduct observations when the acoustic source is not operating for comparison of sightings rates and behavior with and without use of the acoustic source and between acquisition periods, to the maximum extent practicable.

Visual PSOs may be on watch for a maximum of four consecutive hours followed by a break of at least one hour between watches and may conduct a maximum of 12 hours of observation per 24-hour period.

#### *Exclusion Zone and Buffer Zone*

An exclusion zone (EZ) is a defined area within which occurrence of a marine mammal triggers mitigation action intended to reduce the potential for certain outcome, *e.g.*, auditory injury, disruption of critical behaviors. The PSOs would establish a minimum EZ with a 100 m radius with an additional 100 m buffer zone (total of 200 m). The 200m zone would be based on radial distance from the edge of the airgun array (rather than being based on the center of the array or around the vessel itself). With certain exceptions (described below), if a marine mammal appears within or enters this zone, the acoustic source would be shut down.

The 100 m EZ, with additional 100 m buffer zone, is intended to be precautionary in the sense that it would be expected to contain sound exceeding the injury criteria for all cetacean hearing groups, (based on the dual criteria of  $SEL_{cum}$  and peak SPL), while also providing a consistent, reasonably observable zone within which PSOs would typically be able to conduct effective observational effort. Additionally, a 100 m EZ is expected to minimize the likelihood that marine mammals will be exposed to levels likely to result in more severe behavioral responses. Although significantly greater distances may be observed from an elevated platform under good conditions, we believe that 100 m is regularly attainable for PSOs using the naked eye during typical conditions.

An extended 500 m exclusion zone must be established for beaked whales, large whales with a calf (defined as an animal less than two-thirds the body size of an adult observed to be in close association with an adult), and an aggregation of six or more whales during all survey effort. No buffer zone is required.

#### *Pre-Clearance and Ramp-up*

Ramp-up (sometimes referred to as “soft start”) is the gradual and systematic increase of emitted sound levels from an airgun array. Ramp-up would begin with one GI airgun 45 cu in first being activated, followed by the second after 5 minutes. The intent of pre-clearance observation (30 minutes) is to ensure no marine mammals are observed within the buffer zone prior to the beginning of ramp-up. During pre-clearance is the only time observations of marine mammals in the buffer zone would prevent operations (*i.e.*, the beginning of ramp-up). The intent of ramp-up is to warn protected species of pending seismic operations and to allow sufficient time for those animals to leave the immediate vicinity. A ramp-up procedure, involving a stepwise increase in the number of airguns are activated and the full volume is achieved, is required at all times as part of the activation of the acoustic source. All operators must adhere to the following pre-clearance and ramp-up requirements:

- (1) The operator must notify a designated PSO of the planned start of ramp-up as agreed upon with the lead PSO; the notification time should not be less than 60 minutes prior to the planned ramp-up in order to allow PSOs time to monitor the exclusion and buffer zones for 30 minutes prior to the initiation of ramp-up (pre-clearance);
- Ramp-ups shall be scheduled so as to minimize the time spent with the source activated prior to reaching the designated run-in;
  - One of the PSOs conducting pre-clearance observations must be notified again immediately prior to initiating ramp-up procedures and the operator must receive confirmation from the PSO to proceed;
  - Ramp-up may not be initiated if any marine mammal is within the applicable exclusion or buffer zone. If a marine mammal is observed within the applicable exclusion zone or the buffer zone during the 30 minutes pre-clearance period, ramp-up may not begin until the animal(s) has been observed exiting the zones or until an additional time period has elapsed with no further sightings (15 minutes for small odontocetes and pinnipeds, and 30 minutes for Mysticetes and all other odontocetes, including sperm whales and beaked whales);
  - PSOs must monitor the exclusion and buffer zones during ramp-up, and ramp-up must cease and the source must be shut down upon detection of a marine mammal within the applicable exclusion zone. Once ramp-up has begun, detections of marine mammals within the buffer zone do not require shutdown, but such observation shall be communicated to the operator to prepare for the potential shutdown; and
- (2) If the acoustic source is shut down for brief periods (*i.e.*, less than 30 minutes) for reasons other than that described for shutdown (*e.g.*, mechanical difficulty), it

may be activated again without ramp-up if PSOs have maintained constant observation and no detections of marine mammals have occurred within the applicable exclusion zone. For any longer shutdown, pre-start clearance observation and ramp-up are required. For any shutdown at night or in periods of poor visibility (*e.g.*, BSS 4 or greater), ramp-up is required, but if the shutdown period was brief and constant observation was maintained, pre-start clearance watch is not required.

- Testing of the acoustic source involving all elements requires ramp-up. Testing limited to individual source elements does not require ramp-up but does require pre-start clearance watch.

#### *Shutdown Procedures*

The shutdown of an airgun array requires the immediate de-activation of all individual airgun elements of the array. Any PSO on duty will have the authority to delay the start of survey operations or to call for shutdown of the acoustic source if a marine mammal is detected within the applicable exclusion zone. The operator must also establish and maintain clear lines of communication directly between PSOs on duty and crew controlling the acoustic source to ensure that shutdown commands are conveyed swiftly while allowing PSOs to maintain watch. When the airgun array is active (*i.e.*, anytime one or more airguns is active, including during ramp-up) and (1) a marine mammal appears within or enters the applicable exclusion zone the acoustic source will be shut down. When shutdown is called for by a PSO, the acoustic source will be immediately deactivated and any dispute resolved only following deactivation.

Following a shutdown, airgun activity would not resume until the marine mammal has cleared the EZ. The animal would be considered to have cleared the EZ if it is visually observed to have departed the EZ, or it has not been seen within the EZ for 15 minutes in the case of small odontocetes and pinnipeds, and 30 minutes for Mysticetes



and all other odontocetes, including sperm and beaked whales, with no further observation of the marine mammal(s).

Upon implementation of shutdown, the source may be reactivated after the marine mammal(s) has been observed exiting the applicable exclusion zone (*i.e.*, animal is not required to fully exit the buffer zone where applicable) or following a clearance period (15 minutes for small odontocetes and pinnipeds, and 30 minutes for mysticetes and all other odontocetes, including sperm whales, beaked whales, pilot whales, killer whales, and Risso's dolphin) with no further observation of the marine mammal(s).

NSF must implement shutdown if a marine mammal species for which take was not authorized, or a species for which authorization was granted but the takes have been met, approaches the Level B harassment zones.

#### *Vessel Strike Avoidance Measures*

These measures apply to all vessels associated with the planned survey activity; however, we note that these requirements do not apply in any case where compliance would create an imminent and serious threat to a person or vessel or to the extent that a vessel is restricted in its ability to maneuver and, because of the restriction, cannot comply. These measures include the following:

- (1) Vessel operators and crews must maintain a vigilant watch for all marine mammals and slow down, stop their vessel, or alter course, as appropriate and regardless of vessel size, to avoid striking any marine mammal. A single marine mammal at the surface may indicate the presence of submerged animals in the vicinity of the vessel; therefore, precautionary measures should be exercised when an animal is observed. A visual observer aboard the vessel must monitor a vessel strike avoidance zone around the vessel (specific distances detailed below), to ensure the potential for strike is minimized.

Visual observers monitoring the vessel strike avoidance zone can be either

third-party observers or crew members, but crew members responsible for these duties must be provided sufficient training to distinguish marine mammals from other phenomena and broadly to identify a marine mammal to broad taxonomic group (*i.e.*, as a large whale or other marine mammal);

- (2) Vessel speeds must be reduced to 10 kn or less when mother/calf pairs, pods, or large assemblages of any marine mammal are observed near a vessel;
- (3) All vessels must maintain a minimum separation distance of 100 m from large whales (*i.e.*, sperm whales and all mysticetes);
- (4) All vessels must attempt to maintain a minimum separation distance of 50 m from all other marine mammals, with an exception made for those animals that approach the vessel; and
- (5) When marine mammals are sighted while a vessel is underway, the vessel should take action as necessary to avoid violating the relevant separation distance (*e.g.*, attempt to remain parallel to the animal's course, avoid excessive speed or abrupt changes in direction until the animal has left the area). If marine mammals are sighted within the relevant separation distance, the vessel should reduce speed and shift the engine to neutral, not engaging the engines until animals are clear of the area. This recommendation does not apply to any vessel towing gear.

Based on our evaluation of the applicant's planned measures, NMFS has determined that the mitigation measures provide the means of effecting the least practicable impact on the affected species or stocks and their habitat, paying particular attention to rookeries, mating grounds, and areas of similar significance.

### **Monitoring and Reporting**

In order to issue an IHA for an activity, section 101(a)(5)(D) of the MMPA states that NMFS must set forth requirements pertaining to the monitoring and reporting of such

taking. The MMPA implementing regulations at 50 CFR 216.104(a)(13) indicate that requests for authorizations must include the suggested means of accomplishing the necessary monitoring and reporting that will result in increased knowledge of the species and of the level of taking or impacts on populations of marine mammals that are expected to be present while conducting the activities. Effective reporting is critical both to compliance as well as ensuring that the most value is obtained from the required monitoring.

Monitoring and reporting requirements prescribed by NMFS should contribute to improved understanding of one or more of the following:

- Occurrence of marine mammal species or stocks in the area in which take is anticipated (*e.g.*, presence, abundance, distribution, density);
- Nature, scope, or context of likely marine mammal exposure to potential stressors/impacts (individual or cumulative, acute or chronic), through better understanding of: (1) action or environment (*e.g.*, source characterization, propagation, ambient noise); (2) affected species (*e.g.*, life history, dive patterns); (3) co-occurrence of marine mammal species with the activity; or (4) biological or behavioral context of exposure (*e.g.*, age, calving or feeding areas);
- Individual marine mammal responses (behavioral or physiological) to acoustic stressors (acute, chronic, or cumulative), other stressors, or cumulative impacts from multiple stressors;
- How anticipated responses to stressors impact either: (1) long-term fitness and survival of individual marine mammals; or (2) populations, species, or stocks;
- Effects on marine mammal habitat (*e.g.*, marine mammal prey species, acoustic habitat, or other important physical components of marine mammal habitat); and
- Mitigation and monitoring effectiveness.

*Vessel-Based Visual Monitoring*

As described above, PSO observations would take place during daytime airgun operations. During seismic operations, at least three visual PSO would be based aboard the *Palmer*, with a minimum of one on duty at all times during daylight hours. NMFS' typical requirements for surveys of this type include a minimum of two PSOs on duty at all times during daylight hours. However, NSF stated in communications with NMFS that the requirement is not practicable in this circumstance due to the remote location of the survey and associated logistical issues, including limited capacity to fly PSOs into and out of McMurdo Station in Antarctica and limited berth space on the *Palmer*, and requested an exception to the requirement. NMFS agrees that, in this circumstance, the requirement to have a minimum of two PSOs on duty during all daylight hours would be impracticable and, therefore, a minimum of one PSO must be on duty. NSF must employ two PSOs on duty during all daylight hours to the maximum extent practicable. NSF Monitoring shall be conducted in accordance with the following requirements:

- (1) PSOs shall be independent, dedicated and trained and must be employed by a third-party observer provider;
- (2) The operator must work with the selected third-party observer provider to ensure PSOs have all equipment (including backup equipment) needed to adequately perform necessary tasks, including accurate determination of distance and bearing to observed marine mammals. Such equipment, at a minimum, must include:
  - Reticle binoculars (e.g., 7 x 50) of appropriate quality (at least one per PSO, plus backups).
  - Global Positioning Unit (GPS) (plus backup).
  - Digital single-lens reflex cameras of appropriate quality that capture photographs and video (plus backup).
  - Compass (plus backup)

- Radios for communication among vessel crew and PSOs (at least one per PSO, plus backups).
  - Any other tools necessary to adequately perform necessary PSO tasks.
- (3) PSOs shall have no tasks other than to conduct visual observational effort, collect data, and communicate with and instruct relevant vessel crew with regard to the presence of protected species and mitigation requirements (including brief alerts regarding maritime hazards);
  - (4) PSOs shall have successfully completed an approved PSO training course appropriate for their designated task (visual or acoustic);
  - (5) NMFS must review and approve PSO resumes accompanied by a relevant training course information packet that includes the name and qualifications (*i.e.*, experience, training completed, or educational background) of the instructor(s), the course outline or syllabus, and course reference material as well as a document stating successful completion of the course;
  - (6) NMFS shall have one week to approve PSOs from the time that the necessary information is submitted, after which PSOs meeting the minimum requirements shall automatically be considered approved;
  - (7) PSOs must successfully complete relevant training, including completion of all required coursework and passing (80 percent or greater) a written and/or oral examination developed for the training program;
  - (8) PSOs must have successfully attained a bachelor's degree from an accredited college or university with a major in one of the natural sciences, a minimum of 30 semester hours or equivalent in the biological sciences, and at least one undergraduate course in math or statistics; and
  - (9) The educational requirements may be waived if the PSO has acquired the relevant skills through alternate experience. Requests for such a waiver shall be submitted

to NMFS and must include written justification. Requests shall be granted or denied (with justification) by NMFS within one week of receipt of submitted information. Alternate experience that may be considered includes, but is not limited to

- secondary education and/or experience comparable to PSO duties;
- previous work experience conducting academic, commercial, or government-sponsored protected species surveys; or
- previous work experience as a PSO; the PSO should demonstrate good standing and consistently good performance of PSO duties.

PSOs must use standardized data collection forms, whether hard copy or electronic. PSOs must record detailed information about any implementation of mitigation requirements, including the distance of animals to the acoustic source and description of specific actions that ensued, the behavior of the animal(s), any observed changes in behavior before and after implementation of mitigation, and if shutdown was implemented, the length of time before any subsequent ramp-up of the acoustic source. If required mitigation was not implemented, PSOs should record a description of the circumstances. At a minimum, the following information must be recorded:

- Vessel name and call sign;
- PSO names and affiliations;
- Date and participants of PSO briefings (as discussed in General Requirement);
- Dates of departure and return to port with port name;
- Dates and times (Greenwich Mean Time) of survey effort and times corresponding with PSO effort;
- Vessel location (latitude/longitude) when survey effort began and ended and vessel location at beginning and end of visual PSO duty shifts;

- Vessel heading and speed at beginning and end of visual PSO duty shifts and upon any line change;
- Environmental conditions while on visual survey (at beginning and end of PSO shift and whenever conditions changed significantly), including BSS and any other relevant weather conditions including cloud cover, fog, sun glare, and overall visibility to the horizon;
- Factors that may have contributed to impaired observations during each PSO shift change or as needed as environmental conditions changed (*e.g.*, vessel traffic, equipment malfunctions); and
- Survey activity information, such as acoustic source power output while in operation, number and volume of airguns operating in the array, tow depth of the array, and any other notes of significance (*i.e.*, pre-start clearance, ramp-up, shutdown, testing, shooting, ramp-up completion, end of operations, streamers, *etc.*).

The following information should be recorded upon visual observation of any marine mammal:

- Watch status (sighting made by PSO on/off effort, opportunistic, crew, alternate vessel/platform);
- PSO who sighted the animal;
- Time of sighting;
- Vessel location at time of sighting;
- Water depth;
- Direction of vessel's travel (compass direction);
- Direction of animal's travel relative to the vessel;
- Pace of the animal;

- Estimated distance to the animal and its heading relative to vessel at initial sighting;
- Identification of the animal (*e.g.*, genus/species, lowest possible taxonomic level, or unidentified) and the composition of the group if there is a mix of species;
- Estimated number of animals (high/low/best);
- Estimated number of animals by cohort (adults, yearlings, juveniles, calves, group composition, *etc.*);
- Description (as many distinguishing features as possible of each individual seen, including length, shape, color, pattern, scars or markings, shape and size of dorsal fin, shape of head, and blow characteristics);
- Detailed behavior observations (*e.g.*, number of blows/breaths, number of surfaces, breaching, spyhopping, diving, feeding, traveling; as explicit and detailed as possible; note any observed changes in behavior);
- Animal's closest point of approach (CPA) and/or closest distance from any element of the acoustic source;
- Platform activity at time of sighting (*e.g.*, deploying, recovering, testing, shooting, data acquisition, other); and
- Description of any actions implemented in response to the sighting (*e.g.*, delays, shutdown, ramp-up) and time and location of the action.

### *Reporting*

NSF must submit a draft comprehensive report to NMFS on all activities and monitoring results within 90 days of the completion of the survey or expiration of the IHA, whichever comes sooner. The report would describe the operations that were conducted and sightings of marine mammals near the operations. The report would provide full documentation of methods, results, and interpretation pertaining to all monitoring. The 90-day report would summarize the dates and locations of seismic



operations, and all marine mammal sightings (dates, times, locations, activities, associated seismic survey activities). The report would also include estimates of the number and nature of exposures that occurred above the harassment threshold based on PSO observations and including an estimate of those that were not detected, in consideration of both the characteristics and behaviors of the species of marine mammals that affect detectability, as well as the environmental factors that affect detectability.

The draft report shall also include geo-referenced time-stamped vessel tracklines for all time periods during which airguns were operating. Tracklines should include points recording any change in airgun status (*e.g.*, when the airguns began operating, when they were turned off, or when they changed from full array to single gun or vice versa). Geographic Information System (GIS) files shall be provided in Environmental Systems Research Institute (ESRI) shapefile format and include the Coordinated Universal Time (UTC) date and time, latitude in decimal degrees, and longitude in decimal degrees. All coordinates shall be referenced to the WGS84 geographic coordinate system. In addition to the report, all raw observational data shall be made available to NMFS. The report must summarize the data collected as described above and in the IHA. A final report must be submitted within 30 days following resolution of any comments on the draft report.

#### *Reporting Injured or Dead Marine Mammals*

Discovery of injured or dead marine mammals—In the event that personnel involved in survey activities covered by the authorization discover an injured or dead marine mammal, the NSF shall report the incident to the Office of Protected Resources (OPR), NMFS as soon as feasible. The report must include the following information:

- Time, date, and location (latitude/longitude) of the first discovery (and updated location information if known and applicable);
- Species identification (if known) or description of the animal(s) involved;

- Condition of the animal(s) (including carcass condition if the animal is dead);
- Observed behaviors of the animal(s), if alive;
- If available, photographs or video footage of the animal(s); and
- General circumstances under which the animal was discovered.

Vessel strike—In the event of a ship strike of a marine mammal by any vessel involved in the activities covered by the authorization, L-DEO shall report the incident to Office of Protected Resources (OPR), NMFS and to the NMFS West Coast Regional Stranding Coordinator as soon as feasible. The report must include the following information:

- Time, date, and location (latitude/longitude) of the incident;
- Vessel's speed during and leading up to the incident;
- Vessel's course/heading and what operations were being conducted (if applicable);
- Status of all sound sources in use;
- Description of avoidance measures/requirements that were in place at the time of the strike and what additional measure were taken, if any, to avoid strike;
- Environmental conditions (*e.g.*, wind speed and direction, Beaufort sea state, cloud cover, visibility) immediately preceding the strike;
- Species identification (if known) or description of the animal(s) involved;
- Estimated size and length of the animal that was struck;
- Description of the behavior of the animal immediately preceding and following the strike;
- If available, description of the presence and behavior of any other marine mammals present immediately preceding the strike;
- Estimated fate of the animal (*e.g.*, dead, injured but alive, injured and moving, blood or tissue observed in the water, status unknown, disappeared); and To the extent practicable, photographs or video footage of the animal(s).

## Negligible Impact Analysis and Determination

NMFS has defined negligible impact as an impact resulting from the specified activity that cannot be reasonably expected to, and is not reasonably likely to, adversely affect the species or stock through effects on annual rates of recruitment or survival (50 CFR 216.103). A negligible impact finding is based on the lack of likely adverse effects on annual rates of recruitment or survival (*i.e.*, population-level effects). An estimate of the number of takes alone is not enough information on which to base an impact determination. In addition to considering estimates of the number of marine mammals that might be “taken” through harassment, NMFS considers other factors, such as the likely nature of any impacts or responses (*e.g.*, intensity, duration), the context of any impacts or responses (*e.g.*, critical reproductive time or location, foraging impacts affecting energetics), as well as effects on habitat, and the likely effectiveness of the mitigation. We also assess the number, intensity, and context of estimated takes by evaluating this information relative to population status. Consistent with the 1989 preamble for NMFS’ implementing regulations (54 FR 40338; September 29, 1989), the impacts from other past and ongoing anthropogenic activities are incorporated into this analysis via their impacts on the baseline (*e.g.*, as reflected in the regulatory status of the species, population size and growth rate where known, ongoing sources of human-caused mortality, or ambient noise levels).

To avoid repetition, the discussion of our analysis applies to all the species listed in Table 6, given that the anticipated effects of this activity on these different marine mammal stocks are expected to be similar, except where a species- or stock-specific discussion is warranted. NMFS does not anticipate that serious injury or mortality would occur as a result from low-energy survey, even in the absence of mitigation, and no serious injury or mortality is authorized. As discussed in the **Potential Effects of Specified Activities on Marine Mammals and their Habitat** section, non-auditory

physical effects and vessel strike are not expected to occur. NMFS expects that all potential take would be in the form of Level B behavioral harassment in the form of temporary avoidance of the area or decreased foraging (if such activity was occurring), responses that are considered to be of low severity, and with no lasting biological consequences (*e.g.*, Southall *et al.*, 2007, 2021). These low-level impacts of behavioral harassment are not likely to impact the overall fitness of any individual or lead to population level effects of any species. As described above, Level A harassment is not expected to occur given the estimated small size of the Level A harassment zones.

In addition to being temporary, the maximum expected Level B harassment zone around the survey vessel is 1,089 m (and as much as 6,456 m for icebreaking activities). Therefore, the ensonified area surrounding the vessel is relatively small compared to the overall distribution of animals in the area and their use of the habitat. Feeding behavior is not likely to be significantly impacted as prey species are mobile and are broadly distributed throughout the survey area; therefore, marine mammals that may be temporarily displaced during survey activities are expected to be able to resume foraging once they have moved away from areas with disturbing levels of underwater noise. Because of the short duration (19 days) and temporary nature of the disturbance and the availability of similar habitat and resources in the surrounding area, the impacts to marine mammals and the food sources that they utilize are not expected to cause significant or long-term consequences for individual marine mammals or their populations.

NMFS does not anticipate that serious injury or mortality would occur as a result of NSF's seismic survey, even in the absence of mitigation. Thus, the authorization does not authorize any serious injury or mortality. As discussed in the **Potential Effects of Specified Activities on Marine Mammals and their Habitat** section, non-auditory physical effects, stranding, and vessel strike are not expected to occur.

No takes by Level A harassment are authorized. The 100-m EZ encompasses the Level A harassment isopleths for all marine mammal hearing groups, and is expected to prevent animals from being exposed to sound levels that would cause PTS. Also, as described above, we expect that marine mammals would be likely to move away from a sound source that represents an aversive stimulus, especially at levels that would be expected to result in PTS, given sufficient notice of the RVIB *Palmer's* approach due to the vessel's relatively low speed when conducting seismic survey. We expect that any instances of take would be in the form of short-term Level B behavioral harassment in the form of temporary avoidance of the area or decreased foraging (if such activity were occurring), reactions that are considered to be of low severity and with no lasting biological consequences (*e.g.*, Southall *et al.*, 2007).

Potential impacts to marine mammal habitat were discussed previously in this document (see **Potential Effects of Specified Activities on Marine Mammals and their Habitat**). Marine mammal habitat may be impacted by elevated sound levels, but these impacts would be temporary. Feeding behavior is not likely to be significantly impacted, as marine mammals appear to be less likely to exhibit behavioral reactions or avoidance responses while engaged in feeding activities (Richardson *et al.*, 1995). Prey species are mobile and are broadly distributed throughout the project area; therefore, marine mammals that may be temporarily displaced during survey activities are expected to be able to resume foraging once they have moved away from areas with disturbing levels of underwater noise. Because of the temporary nature of the disturbance, the availability of similar habitat and resources in the surrounding area, and the lack of important or unique marine mammal habitat, the impacts to marine mammals and the food sources that they utilize are not expected to cause significant or long-term consequences for individual marine mammals or their populations. In addition, there are no feeding, mating or calving areas known to be biologically important to marine mammals within the project area.

As explained above in the **Description of Marine Mammals in the Area of Specified Activities** section, marine mammals in the survey area are not assigned to NMFS stocks. Therefore, we rely on the best available information on the abundance estimates for the species of marine mammals that could be taken. The activity is expected to impact a very small percentage of all marine mammal populations that would be affected by NSF's survey (approximately three percent or less each for all marine mammal populations where abundance estimates exist). Additionally, the acoustic "footprint" of the survey would be very small relative to the ranges of all marine mammal species that would potentially be affected. Sound levels would increase in the marine environment in a relatively small area surrounding the vessel compared to the range of the marine mammals within the survey area. The seismic array would be active 24 hours per day throughout the duration of the survey. However, the very brief overall duration of the survey (19 days) would further limit potential impacts that may occur as a result of the activity.

The mitigation measures are expected to reduce the number and/or severity of takes by allowing for detection of marine mammals in the vicinity of the vessel by visual observers, and by minimizing the severity of any potential exposures via ramp-ups and shutdowns of the airgun array.

Of the marine mammal species that are likely to occur in the project area, the following species are listed as endangered under the ESA: blue, fin, sei, and sperm whales. We are proposing to authorize very small numbers of takes for these species (Table 11 and Table 13), relative to their population sizes (again, for species where population abundance estimates exist), therefore we do not expect population-level impacts to any of these species. The other marine mammal species that may be taken by harassment during NSF's seismic survey are not listed as threatened or endangered under

the ESA. There is no designated critical habitat for any ESA-listed marine mammals within the project area.

NMFS concludes that exposures of marine mammals due to NSF's planned seismic survey would result in only short-term (temporary and short in duration) effects to individuals exposed. Marine mammals may temporarily avoid the immediate area, but are not expected to permanently abandon the area. Major shifts in habitat use, distribution, or foraging success are not expected. NMFS does not anticipate the take estimates to impact annual rates of recruitment or survival.

In summary and as described above, the following factors primarily support our determination that the impacts resulting from this activity are not expected to adversely affect the species or stock through effects on annual rates of recruitment or survival:

- (1) No mortality, serious injury or Level A harassment is anticipated or authorized;
- (2) The anticipated impacts of the activity on marine mammals would primarily be temporary behavioral changes of small percentages of the affected species due to avoidance of the area around the survey vessel. The relatively short duration of the survey (19 days) would further limit the potential impacts of any temporary behavioral changes that would occur;
- (3) The availability of alternate areas of similar habitat value for marine mammals to temporarily vacate the survey area during the survey to avoid exposure to sounds from the activity;
- (4) The potential adverse effects of the survey on fish or invertebrate species that serve as prey species for marine mammals would be temporary and spatially limited; and
- (5) The mitigation measures, including visual monitoring, ramp-ups, and shutdowns, are expected to minimize potential impacts to marine mammals.

Based on the analysis contained herein of the likely effects of the specified activity on marine mammals and their habitat, and taking into consideration the implementation of the monitoring and mitigation measures, NMFS finds that the total marine mammal take from the activity would have a negligible impact on all affected marine mammal species or stocks.

### **Small Numbers**

As noted previously, only small numbers of incidental take may be authorized under sections 101(a)(5)(A) and (D) of the MMPA for specified activities other than military readiness activities. The MMPA does not define small numbers and so, in practice, where estimated numbers are available, NMFS compares the number of individuals taken to the most appropriate estimation of abundance of the relevant species or stock in our determination of whether an authorization is limited to small numbers of marine mammals. When the predicted number of individuals to be taken is fewer than one-third of the species or stock abundance, the take is considered to be of small numbers. Additionally, other qualitative factors may be considered in the analysis, such as the temporal or spatial scale of the activities.

The amount of take NMFS authorizes is below one third of the estimated stock abundance for all species (in fact, take of individuals is less than ten percent of the abundance of the affected stocks, see Table 6). This is likely a conservative estimate because we assume all takes are of different individual animals, which is likely not the case. Some individuals may be encountered multiple times in a day, but PSOs would count them as separate individuals if they cannot be identified.

Based on the analysis contained herein of the activity (including the mitigation and monitoring measures) and the anticipated take of marine mammals, NMFS finds that small numbers of marine mammals would be taken relative to the population size of the affected species or stocks.



## **Unmitigable Adverse Impact Analysis and Determination**

There are no relevant subsistence uses of the affected marine mammal stocks or species implicated by this action. Therefore, NMFS has determined that the total taking of affected species or stocks would not have an unmitigable adverse impact on the availability of such species or stocks for taking for subsistence purposes.

## **National Environmental Policy Act**

To comply with the National Environmental Policy Act of 1969 (NEPA; 42 U.S.C. 4321 *et seq.*) and NOAA Administrative Order (NAO) 216-6A, NMFS must review our action (*i.e.*, the issuance of an IHA) with respect to potential impacts on the human environment.

This action is consistent with categories of activities identified in Categorical Exclusion B4 (IHAs with no anticipated serious injury or mortality) of the Companion Manual for NOAA Administrative Order 216-6A, which do not individually or cumulatively have the potential for significant impacts on the quality of the human environment and for which we have not identified any extraordinary circumstances that would preclude this categorical exclusion. Accordingly, NMFS has determined that the issuance of the IHA qualifies to be categorically excluded from further NEPA review.

## **Endangered Species Act**

Section 7(a)(2) of the Endangered Species Act of 1973 (ESA: 16 U.S.C. 1531 *et seq.*) requires that each Federal agency insure that any action it authorizes, funds, or carries out is not likely to jeopardize the continued existence of any endangered or threatened species or result in the destruction or adverse modification of designated critical habitat. To ensure ESA compliance for the issuance of IHAs, NMFS consults internally whenever we authorize take for endangered or threatened species, in this case with the ESA Interagency Cooperation Division within NMFS' OPR.

The NMFS Office of Protected Resources (OPR) ESA Interagency Cooperation Division issued a Biological Opinion under section 7 of the ESA, on the issuance of an IHA to NSF under section 101(a)(5)(D) of the MMPA by the NMFS OPR Permits and Conservation Division. The Biological Opinion concluded that the action is not likely to jeopardize the continued existence of ESA-listed blue whales, fin whales, sei whales, and sperm whales. There is no designated critical habitat in the action area for any ESA-listed marine mammal species

### **Authorization**

As a result of these determinations, NMFS has issued an IHA to NSF for conducting seismic survey and icebreaking in the Ross Sea, in January through February 2023, provided the previously mentioned mitigation, monitoring, and reporting requirements are incorporated. The IHA can be found at:

*<https://www.fisheries.noaa.gov/action/incidental-take-authorization-national-science-foundation-office-polar-programs-geophysical>.*

Dated: December 14, 2022.

**Kimberly Damon-Randall,**

*Director, Office of Protected Resources,*

*National Marine Fisheries Service.*